DOCUMENT RESUME

ED 319 595 SE 051 405

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TITLE Results of an Inservice Workshop To Promote Science-Technology-Society (STS) Instructional Orientations.
PUB DATE 90
NOTE 11p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (63rd, Atlanta, GA, April 8-11, 1990).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Secondary Education; *Inservice Teacher Education; Program Effectiveness; Program Evaluation; *Rural Schools; *Science and Society; Science Instruction; Science Teachers; Teacher Education Programs; *Workshops
IDENTIFIERS *Science Technology and Society Courses

ABSTRACT

This study examined the influence of a 1-week intensive inservice workshop on the teacher's recognition of contemporary goals of science education and for developing science-technology-society (S-T-S) instructional themes. The inservice participants consisted of a group of 13 experienced teachers from rural school districts whose instructional assignments were either primarily science or social studies with a requirement to also teach science. Data were collected using "Contemporary Goals Survey" (CGS) and "Stages of Concern (SoC) instrument. The CGS data analysis indicated significant differences between pretest and posttest scores for seven of the eight item statements. A qualitative examination of SoC profiles indicated a shift away from the three lower (Awareness, Informational, and Personal) and toward the three higher (Consequence, Collaboration, and Refocusing) Stages of Concern toward S-T-S instruction. The results of this study indicate that an intensive workshop is capable of promoting a shift in instructional orientation in a direction consistent with the stated goals. (Author/YP)

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RESULTS OF AN INSERVICE WORKSHOP TO PROMOTE SCIENCE-TECHNOLOGY-SOCIETY (STS) INSTRUCTIONAL ORIENTATIONS

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RESULTS OF AN INSERVICE WORKSHOP TO PROMOTE SCIENCE-TECHNOLOGY-SOCIETY (STS) INSTRUCTIONAL ORIENTATIONS

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Paper Presented at the
National Association for Research in Science Teaching
Annual Meeting, April 8 - April 11, 1990
Atlanta, Georgia

NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING
1990 ANNUAL MEETING - ATLANTA, GEORGIA

TITLE: The Results of an Inservice Workshop to Promote Science-Technology-Society Instructional Orientations

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ABSTRACT

The primary intent of this study was to examine the influence of a one-week intensive inservice workshop toward the recognition of more contemporary goals of science education and for developing science-technology-society instructional themes. In addition, it provided for a promotion of the "Learning Cycle" as an alternative instructional strategy and an examination of teaching techniques involving visual technologies. Finally, the workshop provided an opportunity for participants to identify environmental issues of local importance; issues that could be used as vehicles for developing interdisciplinary instructional cooperation among science and social studies teachers. Inservice participants consisted of a group of thirteen certified, experienced teachers (5 or more years of employment) from rural school districts whose instructional assignments were either primarily science or social studies with a requirement to also teach science.

Data were collected both prior to the first day's and immediately following the last day's workshop presentations and activities. To assess inservice participants' initial and final orientations toward more contemporary goals of science education, an 8-item, bi-polar instrument entitled the "Contemporary Goals Survey (CGS)" (McIntosh & Zeidler, 1988) was administered. In addition, to assess participants' understanding of and concern for the use of Science-Technology-Society (S-T-S) instructional themes, the well known "Stages of Concern (SoC)" instrument (Hall, George & Rutherford, 1979) was administered simultaneously with the CGS.

The CGS data analysis, using the nonparametric Wilcoxon test, indicated significant differences between Pretest and Posttest scores for seven of the eight item statements. Each of these differences were in a direction consistent with a contemporary goals orientation as defined by the National Science Teachers Association in a position paper regarding S-T-S instruction (NSTA, 1982). The overall score difference on the CGS instrument was also highly significant ($p < 0.001$). To provide further evidence regarding the potential effectiveness of the inservice workshop, the CGS was administered to a group of sixteen science and social studies graduate students enrolled in a Masters/Doctoral level course entitled "The Science Curriculum". Although graduate students' overall scores were slightly higher than their inservice counterparts, no significant differences between graduate and inservice "pretest" orientations were found. However, graduate students' overall scores were still significantly lower than inservice "posttest" results ($p < 0.001$).

Finally, a qualitative examination of SoC profiles among inservice "pretest" and inservice "posttest" data indicated a shift away from the three lower (Awareness, Informational, and Personal) and toward the three higher (Consequence, Collaboration, and Refocusing) Stages of Concern toward S-T-S instruction. Consistent with the CGS data, the graduate students' SoC profile fell directly between the two samples collected from the inservice teachers and more similar to the profile of the "pretest" inservice results.

The results of this study indicate that an intensive inservice workshop is capable of promoting a significant shift in instructional orientation in a direction consistent with the stated goals of the National Science Teachers Association. Such a conclusion is in concert with the views of McIntosh and Zeidler (1988) when they suggested the need for a more direct effort to disseminate NSTA, NARST, and AETS goals at the local level.

INTRODUCTION

Over the course of the past decade, the National Science Teachers Association (NSTA) has attempted to promote a more unified approach to science instruction. Such instruction was to take into account the personal needs of students, the need to resolve persistent societal issues requiring cooperative scientific, cultural, and technologic solutions, an awareness of scientific careers, and still provide sound academic preparation to foster a desire for further scientific study (Harms & Yager, 1981). NSTA further delineated, in a position paper, a means to accomplish this more unified approach through the promotion of Science-Technology-Society (S-T-S) instructional themes (NSTA, 1982). More recently NSTA revised its central focus for the next decade in the position paper entitled "Science Education Initiatives for the 1990's" (NSTA, 1988). However, NSTA retained in an implicit form, the premise that S-T-S themes continue to hold promise as vehicles for developing unified science and/or interdisciplinary science/social studies instructional perspectives.

Although NSTA has clearly been fostering the adoption of S-T-S themes for the past seven to ten years, several researchers have reported a general lack of enthusiastic adoption for S-T-S themes (Bybee & Bonstetter, 1987; Pantone, 1987; Bybee, 1987; Thelen, 1987). Each of these researchers noted a variety of problems associated with adoption and implementation of S-T-S instructional themes, ranging from economics to personnel qualifications to lack of administrative support. While each of these problems appears to be valid, they might also be construed as symptomatic of general excuses for resistance to change. Indeed, by assessing practicing science teachers' conceptions of the contemporary goals of science education, McIntosh and Zeidler (1988) indicated a significant percentage of science teachers possess a 1960's orientation to the goals of science education. McIntosh and Zeidler (1988) and Bybee and Bonstetter (1987) called for more direct

contact with practicing science teachers through inservice workshops, summer institutes, etc. to facilitate an awareness, understanding and perhaps greater concern for the adoption of S-T-S instructional themes.

Acting in accordance with the suggestion for taking the S-T-S message directly to practicing science teachers, the author co-wrote and submitted a grant proposal to conduct an inservice workshop during the summer of 1989. The workshop, entitled "Critical Thinking about Ecological Themes," received funding from the Kansas Board of Regents under the Education for Economic Security Act. The primary intent of the workshop study was to examine the influence of a one-week intensive inservice workshop toward the recognition of more contemporary goals of science education and for developing S-T-S instructional themes. In addition, it provided for a promotion of the "Learning Cycle" as an alternative instructional strategy (Lawson, Abraham, & Renner, 1989) and an examination of teaching techniques involving new instructional technologies. Finally, the workshop provided an opportunity for participants to identify environmental/ecological issues of local importance, which could be studied as S-T-S issues, consistent with NSTA documents "Focus on Excellence" (Penick & Meinhard-Pellens, 1984) and 1985 NSTA Yearbook (Bybee, 1986).

METHODOLOGY

Although primarily intended for science teachers, an implicit objective of the workshop was to enable science teachers to provide instruction on ecological themes from a more comprehensive, holistic, and/or interdisciplinary perspective. Thus, especially where it concerned rural teachers, an attempt was made to encourage a partnership between science and social studies teachers; specifically social studies teachers who also were required to provide science instruction and were from the same school district as a science teacher counterpart. Inservice participants consisted of a group of thirteen certified, experienced teachers (5 or

more years of public school employment) from rural school districts whose instructional assignments were either primarily science or social studies with a requirement to also teach science.

Data Collection and Instrumentation

Data were collected both prior to the first day's and immediately following the last day's workshop presentations and activities. To assess inservice participants' initial and final orientations toward more contemporary goals of science education, an instrument entitled the "Contemporary Goals Survey (CGS)" (McIntosh & Zeidler, 1988) was administered. In addition, to assess participants' understanding of and concern for the use of S-T-S instructional themes, the well known "Stages of Concern (SoC)" instrument (Hall, George, & Rutherford, 1979) based on the Concerns-Based-Adoption-Model (CBAM) for introducing innovations was administered simultaneously with the CGS. Finally, to provide further potential evidence regarding the possible effectiveness of the inservice workshop, the CGS and SoC were administered to a group of sixteen science/social studies education graduate students enrolled in a Masters/Doctoral level course entitled "The Science Curriculum". Informal assessment of these graduate students indicated knowledge of and general agreement with the NSTA science education initiatives for the 1980's and 1990's.

The CGS consists of eight bi-polar statements along a 7-point continuum modeled from Kyle (1984). At one end of the continuum, a statement reflects a 1960's orientation and at the opposite extreme, is a statement more reflective of a 1980's/1990's orientation to science education goals. Respondents are required to select between the two extremes and place a check that is consistent with their strength of conviction regarding that choice as either slight, moderate, or strong. A default option of "equal emphasis" is also provided for each statement. Scoring

of the CGS instrument is consistent with a respondent's strength of conviction in a direction considered more congruous with a contemporary goal orientation. Thus, for each item statement, a strong is scored as +7, moderate as +6, slight as +5 consistent with a contemporary goal orientation. An equal emphasis is scored as +4. For a response more consistent with a 1960's orientation, slight is scored as +3, moderate as +2, and strong as +1. The total scores therefore range from +8 (representing a strong 1960's orientation) to a +56 (representing a strong 1980's/1990's orientation); +32 would represent a perception of equal emphasis. Test-retest reliability was reported by the authors to be 0.75 using a sample of 26 public school science teachers (McIntosh & Zeidler, 1988). Content validity was determined by six prominent researchers and teachers in science education who had recently held elected positions in NARST or NSTA.

RESULTS

For each of the groups examined there was no significant correlation between scores on the CGS and number of years of teaching experience, using the non-parametric Spearman's rho test (Conover, 1980). Thus, more recent graduates did not possess an advantage over less recent graduates in having been exposed to S-T-S instructional themes as part of their undergraduate courses in science education. Likewise, less recent graduates were no stronger in their conviction regarding a 1960's orientation on the basis of having been perhaps more directly exposed to such goals during their undergraduate courses in science education.

The CGS data analysis, using the nonparametric Wilcoxon test (Conover, 1980), indicated significant differences between Pretest and Posttest scores for seven of the eight item statements. One item possessed a $p < 0.05$; the remaining six differences were significant possessing a $p < 0.01$. Each of these differences were in a direction consistent with a more contemporary goals orientation as defined by

the NSTA in their position paper regarding S-T-S instruction (NSTA, 1982). The overall score difference on the CGS instrument was also highly significant ($p < 0.001$). The overall scores of the comparison group of science/social studies education graduate students were marginally higher than their inservice counterparts; however, no significant differences between graduate student and inservice teacher "pretest" orientations were found. A highly significant difference was still obtained, using the Mann-Whitney test (Conover, 1980), when comparing graduate students' overall scores with those of their inservice teacher "posttest" counterparts ($p < 0.001$) in a direction favoring the inservice teacher group.

Finally, a qualitative examination of group SoC composite profiles among inservice "pretest" and inservice "posttest" data indicated a shift away from the three lower (Awareness -- Stage 0; Informational -- Stage 1; and Personal -- Stage 2) and toward the three higher (Consequence -- Stage 4; Collaboration -- Stage 5; and Refocusing -- Stage 6) Stages of Concern toward S-T-S instruction. The remaining Stage of Concern, Management (Stage 3) did not shift and represented a "breakpoint" in the overall composite profile to examine comparative changes as a result of the inservice workshop. And, consistent with the CGS data, the graduate students' composite profile fell directly between the two composite profiles representing inservice teachers prior to and immediately following the workshop activities. Graduate students were, however, more similar to the profile of the "pretest" inservice teachers with the exception of Stage 6 (Refocusing).

CONCLUSIONS

The results of this study indicate that an intensive inservice workshop is capable of promoting a significant shift in instructional goals orientation in a direction more congruent with contemporary goals of the National Science Teachers

Association. That inservice teachers' "posttest" CGS scores and SoC profiles far exceeded not only their "pretest" scores but also a comparison group of graduate students is noteworthy. Such a finding is in concert with McIntosh and Zeidler (1988) when they called for an effort to disseminate such goals on the local level and with particular emphasis within the context of inservice workshops. In addition, the comparison between graduate students who might be expected to demonstrate a goals orientation more closely consistent with contemporary standards and yet did not when compared to their inservice "posttest" counterparts, indicates that a more direct presentation of such goals is warranted by such professional organizations such as NSTA, NARST, or AETS.

Finally, even though composite SoC profiles shifted in a direction more conducive to higher levels of concern, the profiles still suggested that additional information was required before realistic implementation of contemporary goals would in actuality occur. This statement is based on the fact that although changes occurred at both the lower stages of concern and higher stages of concern regarding S-T-S instructional themes, the highest profile "percentiles" were still apparent for the three lower stages of concern (Awareness, Informational, and Personal). Thus, the results of this study indicated the overall effectiveness of an intensive workshop in making inservice teachers more aware of contemporary goals; however, as the SoC profiles suggest, additional information and follow-up is required before enthusiastic implementation of such contemporary goals can in reality begin. And, if the graduate students' profile is not unusual, we cannot expect that simply additional graduate coursework that nominally and indirectly treats such issues, will necessarily provide the direct information required by practicing teachers to adopt an instructional innovation (S-T-S) or refocus their instructional goals orientation.

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